the smaller ones there is often much difficulty in securing the funds which are essential to efficient work. A considerable initial equipment may fail to give the results that might be expected because of inability to procure auxiliary apparatus, to secure suitable assistance in making or reducing observations, or to pay necessary expenses of publication.

Furthermore, attention should be called to an important fact which is referred to in some of the more detailed answers to the questions of the circular and which has been emphasized in earlier considerations of the subject of aid for astronomical research made by the chairman of the Committee of One Hundred.

The help most needed in a large majority of cases is found to be that of a trained assistant to aid in any and all the duties which are called for from an astronomer and especially in computing and other routine work. For such purpose a person not subject to the distractions affecting the ordinary graduate student is desirable. To furnish an observatory with well-equipped aid of this character would often increase its output by an amount far in excess of the necessary outlay.

CHARLES R. CROSS, *Chairman,*
Subcommittee on Research Funds

GEOLOGICAL TERMS IN GEOGRAPHICAL DESCRIPTIONS

LAST January Dr. John L. Rich, of the University of Illinois—now Captain in the Intelligence Division of the War Department—sent a letter to SCIENCE expressing his regret that no mention of geological dates was made in a geographical article on the "Block Mountains of New Zealand," by Dr. C. A. Cotton, of Victoria College, Wellington. I have been waiting to see if other geologists would support Captain Rich's view, or if any geographers would take sides with Dr. Cotton; but the discussion has not been continued. As Dr. Cotton was more or less influenced in his method of presentation by several conferences that we had on this subject during an excursion with Professor James Park, of Dunedin, across the New Zealand block-mountain district in 1914, I wish to say a few words on the principles that his method of presentation involves.

The first point to bear in mind is that geological science is much more actively cultivated by trained experts, and is therefore much further developed than geographical science. The second point is that the development of geographical science will be best promoted if geographers follow a discipline of their own, by giving the same single-minded attention to geography that physicists give to physics, astronomers to astronomy, philologists to philology, and so on. The third point is that the best methods of preparing geographical descriptions are still in discussion, and hence experiment on various methods, each one consciously analyzed and intentionally adopted for the time being, is a helpful means of discovering the kind of treatment best adapted for various needs.

Cotton's article is an admirable experiment in the analytic, systematic and regional treatment of a geographical problem. It is to be hoped we may have many more pure geographical cultures of this kind. The gain that such articles contribute to the imperfectly developed science of geography fully compensates, in my opinion, for any loss that the omission of geological dates entails upon the thriving science of geology. Cotton's success must therefore not be measured by the dissatisfaction that his article may create among geologists, but by the satisfaction that it creates among geographers. They should recognize that this excellent study gives, after a careful historical review of the problem under discussion, a critical analysis of the origin of the Block Mountains; that the results of the analysis are systematized or standardized sufficiently for New Zealand needs; that the systematized standards are effectively used in the final pages on regional description; and that the graphic illustration of all its parts is exceptionally good. The only adverse comment that I am disposed to make is that the unlikenesses of the three phases of work, analytic, systematic and regional, are hardly enough emphasized to impress them upon the reader; and that the introduction of some

local examples in the systematic pages and of some explanatory discussion in the regional pages results in blending the two styles of treatment undesirably. I venture to make the further suggestion that a one-page regional summary at the end of the article would have made its results more readily available to geographers in general, and would have at the same time serve as a disciplinary test of the success of all the preceding pages; for geographically speaking, it is in order to prepare such a concise explanatory description of existing forms that the analytical study of their origin and the systematization of the results of analysis are attempted.

The protests that I have made on various occasions, when urging that geographers should develop a scientific discipline of their own, have not been primarily directed against the inclusion of geological terms and items, as such, in a geographical article, for if a geographer wishes to introduce such extraneous matters, not for the benefit of the other geographers whom he is addressing, but for the satisfaction of such geologists as may honor him by their attention, he is surely free to do so although it is difficult to see how he is thereby cultivating or developing geographical science. My protests have been chiefly directed against the use of geological terms in geographical descriptions, where geographical terms are more serviceable.

For example, a recent geographical lecture on northeastern France, published in the *Scottish Geographical Magazine*, described the "escarpments," which dominate the relief of the region between Paris and the Vosges, by the time-names of the geological formations which maintain them. Surely a directly geographical statement of the composition, thickness and attitude of the cuesta-making series of strata would have been more helpful, for it is geographically immaterial when the strata were deposited: but although the lecturer is primarily a geographer, a geological terminology was employed. It is further significant of the immature condition of geography that this well-informed lecturer, addressing a geographical audience in Great Britain on the geography of the neighboring country of France, found it advisable to introduce an elementary explanation of physiographic features so simple as cuestas, as if they were unknown both in kind and in place, and yet did not feel it necessary to give explanatory definitions of technical geological terms such as Triassic and Jurassic! If a geographical audience is not familiar with the physiographic features that are ordinarily associated with a gently dipping series of harder and softer stratified formation, let them be explained by all means; but let the explanation be in pertinent geographical terms, and not in terms so irrelevant as the geological dates when the formations were laid down.

Several years ago the *London Geographical Journal* published an account of a district in central England in an article which purported to be geographical—otherwise it could hardly have found a place in that journal—and which apparently aimed to represent modern methods in scientific geography, but which must certainly have worked to the disadvantage of true geographical discipline; for its introductory pages abounded in remotely irrelevant geological speculations presented in technical geological parlance, and some of its later pages were occupied with painstaking enumerations of plant species, doubtless botanically correct, but not helpful geographically because they did not enable the reader, even if he were as expert a botanist as the writer, to make a correct mental picture of the plant assemblages by which the land forms are covered. The direct description of the landscape, the prime responsibility of a geographical essay, was much less thorough than the geological speculations or the botanical enumerations. Many a British geographer of the old school must have been confirmed, on reading this article, in his disinclination to exchange the empirical method of geographical description, with which he had been familiar from boyhood for the more modern explanatory method; for he would have exclaimed: "If these pages, with their irrelevant geological hypotheses and their detailed lists of botanical species illustrate the modern ex-

planatory method of geographical description, I want none of it!"

It is not only geological terms, but geological habits of thought, that should be avoided in geographical descriptions. For example, an account of a district in northern Africa, published in *La Géographie,* the journal of the Geographical Society of Paris, six or more years ago, included the statement that a certain locality is traversed by a fault, which brings two unlike geological formations together; but nothing was said as to the physiographic expression of the faulted structure. The reason for this silence was, plainly enough, that the author was a geologist who did not distinguish between the geological and the physiographic treatment of faults; he was interested in internal structure, as a geologist must be but he did not extend his interest, as a geographer should, to the point of showing how internal structure, acted upon by exterior forces for a shorter or longer period of time, influence surface form.

Many more examples of the geological habit of thought dominating geographical descriptions are to be found in the employment of the past tense of verbs in the treatment of existing physiographic features. The past tense is eminently fitting in those excellent summaries of physiographic development that are presented in the Geologic Folios of the U. S. Geological Survey, for these summaries are properly enough nothing more than the historic geology of land forms, in which the past tense is fitting. But when physiographic features are presented in geographical descriptions, their treatment should be so devised as to leave the reader vividly impressed with actual land forms as they exist to-day; and nothing is so helpful to this end as the use of verbs in the present tense. In the analytical treatment of physiographic problems, the use of the past tense is unavoidable; and it is for this very reason that analysis should be followed by description, if the best geographical flavor is to be given. It is well enough to say, in the course of analytical investigation, that "the Rahway River was not captured by the Passaic until it had cut a passage across the trap sheets"; but if nothing more is said the reader of such a passage will likely enough be left in the contemplation of the speculative past instead of being brought to realize the actual present.

There is some discussion at present in progress regarding "emergency problems" in education. Geography will, it is to be hoped, have a proper share of consideration. One of its emergency needs to-day is single-minded devotion to its development on the part of its devotees. If there be such a science as geography, let those who pursue it beware of the danger of falling into geological habits of thought on the one side, and into historical habits of thought on the other; let them bring into geography every relevant geological and historical item as freely as geographical items have been carried into geology and history; but let them at the same time conceive and phrase all the items and ideas that are pertinent to their subject in such a way as to give every item and idea a truly geographical flavor, and let them avoid the meretricious method of adding to their geographical articles matter that really belongs elsewhere in the hope of making them more "interesting." If geography can not stand on its own merits, let it fall.

The merit of Cotton's study is, to my reading, that he has striven with praiseworthy single-mindedness to give his subject a purely geographical treatment; his article is therefore a valuable contribution to geographical discipline. He sufficiently indicated the physiographic date of the faulting by which his Block mountains were formed by stating the stage of post-faulting dissection that they now exhibit. He might easily have added geological formation dates for the edification of geologists, petrographical terms for the pleasure of petrographers, and lists of fossils for the benefit of paleontologists, for he is a competent student in all these subjects. He consciously sacrificed these unessential elements in his successful effort to make a contribution to geography alone, as a conscious experiment

in the development of geographical science; and geography profited thereby.

W. M. Davis

Cambridge, Mass.,
June, 1918

ARMAND THEVENIN

The French paleontologist, Armand Thevenin, who lost his life on March 7, at the age of forty-eight years, as a result of experimenting with poisonous gases in connection with the war, will be remembered chiefly for his beautiful memoir on the early vertebrates of France. He was particularly interested during several years in the Coal Measures Amphibia of France and in 1906 under the title "Amphibiens et Reptile du Terrain Houiller de France" he published in the *Annales de Paléontologie* his initial memoir on this subject. In this memoir Thevenin showed a wide acquaintance with the subject of fossil Amphibia and was especially fortunate in the discovery of an interesting and primitive reptile which he described under the name of *Sauravus costei*. This form, as the most ancient reptile of France, is paralleled in America by the form *Eosauravus copei* described by Williston from the Coal Measures of Linton, Ohio.

Four years later appeared Thevenin's monographic contribution to vertebrate paleontology, published with the title "Les plus anciens Quadrupédes de France" in Tome V. of the *Annales de Paléontologie*. This beautifully illustrated and carefully written memoir was awarded a prize by the Academy of Sciences and will now stand for all time as an indication of the ability and ideals of Armand Thevenin. Had his life been spared he doubtless would have given us other memoirs of a like nature, for shortly before the war he was interested in the study of the vertebrate paleontology of Madagascar, of which several studies had appeared in the pages of the *Annales de Paléontologie*. Thevenin summarized the results of his studies on the most ancient vertebrates of France by noting, for both amphibians and reptiles, the diversity of form and structure exhibited by the species which he had studied, suggesting that the vertebrates of the Coal Measures, though very ancient, were still a long way from their origin. A similar conclusion has been reached by students of early vertebrates in America.

Thevenin was fortunate in his association in the Museum National d'Histoire Naturelle with paleontologists of international fame, such as Albert Gaudry and Marcellin Boule and he profited by his association in producing under the stimulus of their influence his interesting studies on fossil vertebrates. His list of papers is not extensive, probably not over a dozen all told, but his work was carefully and well done and he will stand as a worthy worker in the development of vertebrate paleontology. Students of paleontology in the future may gain much by studying carefully the neat and orderly presentation of facts and the beautiful illustrations of his "Les plus anciens Quadrupédes de France" and thus be stimulated to produce better and more carefully wrought pieces of thoughtful endeavor.

Roy L. Moodie

College of Medicine,
University of Illinois

SCIENTIFIC EVENTS

THE KATMAI EXPEDITION OF THE NATIONAL GEOGRAPHICAL SOCIETY

Word has just been received of the safe arrival in the field of this year's National Geographic Society expedition to the Valley of Ten Thousand Smokes. On account of the war and particularly because of the difficulty of securing transportation for a larger party it was deemed advisable to send only two men into the field this year, the director, Dr. Robert F. Griggs, and other members of the expedition remaining behind to work up the unpublished results of the expedition of 1917. The field party consists of Jasper Sayre and Paul R. Hagelbarger, both members of last year's expedition. Their mission is to carry forward reconnaissances into country not reached by previous expeditions and to lay the foundation for more intensive scientific study of the volcanic phenomena manifested in the Valley of